

CLAIMS

1. An interactive printed material and sensor device combination comprising printed material having information incorporated in printing applied to a substrate which is not comprehensible by the human observer, and wherein the sensor device is adapted to sense a property of the printed material and discriminate between regions of the printing thereof, the sensor device including a display screen and means adapted to display on the screen a set of stylised faces displaying, to the human observer, differing conditions, and wherein the sensor device is configured to resemble an animal or humanoid figure with the screen positioned corresponding to the position of the face thereof, and wherein the sensor device includes a sensor head located at an extremity of the humanoid or animal figure.
2. A combination according to Claim 1 wherein the printing on the substrate contains information discernible by the amount of infrared absorptive material in the ink used to effect such printing.
3. A combination according to Claim 1 or 2 wherein the means for displaying a stylised face is configured to display screen areas representative of eyes, nose and mouth, the areas representative of at least eyes and mouth being capable of displaying different stylisation thereof in different combinations to reflect different emotions.
4. A combination according to any one of Claims 1 to 3 wherein the sensor device has a casing configured as a stylised humanoid or animal elongate figure, and wherein the casing includes a sensor module with a sensor head located adjacent one end thereof.
5. A combination according to Claim 4 wherein, adjacent the sensor head, is a pressure-operated switch adapted to trigger sensing of a property of the

printed material when the figure is stood on the surface thereof and in the region of printed material under the end adjacent the sensor head.

6. A combination according to any one of Claims 1 to 5 and including a
5 sound-generating circuit and sound transducer.
7. A combination according to Claim 6 wherein the circuit is adapted to provide an intelligible speech output.
- 10 8. A combination according to Claim 7 wherein the sensor device includes means to vary at least the representation of a mouth on the screen corresponding to and synchronised with the speech output.
- 15 9. A combination according to any one of Claims 1 to 8 and including within the sensor device means for illuminating an area of the printed material adjacent the position at which the sensor device is pressed against the printed material.
- 20 10. A combination according to Claim 9 wherein the means for illuminating are actuated in response to the particular value of a property of the printed material sensed by the sensor device and in accordance with conditions preset internally of the sensor device.
- 25 11. A combination according to any one of Claims 1 to 10 and including within the sensor device means for sensing the value of at least two properties of an area of the printed material against which the sensor device is pressed.
- 30 12. A combination according to Claim 11 wherein the sensor device includes a sensor module adapted to produce an output varying in response to a combination of the two or more properties of the printed material

sensed.

13. A combination according to Claim 11 or 12 wherein the properties sensed are the infra-red absorption of the printed material and its colour.

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14. A combination according to any one of Claims 1 to 13 wherein the sensor device includes means within a sensor module incorporating a microprocessor or ASIC adapted to store data relating to a sequence of sensing operations carried out on the printed material and to produce an
10 output dependent on such data as well as on the property or properties of the printed material being sensed.

15. An interactive printed material and sensor device combination comprising printed material having information incorporated in printing
15 applied to a substrate which is not comprehensible by the human observer, and wherein the sensor device is adapted to sense a property of the printed material and discriminate between regions of the printing thereof, and wherein the sensor device is configured to distinguish the regions by measurement of the property of the printed material into at least five
20 categories, and to provide a human appreciable output varying in dependence on the measurement of the property made and/or a sequence of such measurements.

16. A combination according to Claim 15 wherein the printed material is
25 configured as a multiple option question/answer paper, with a set of readable questions, each of which has, printed in spaced coordinated positions relative thereto, a set of answers, and wherein the printed answers each include an area of printing in a printing ink, a property of which may be sensed by the sensor device.

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17. A combination according to Claim 15 or 16 wherein the printed

material comprises a set of five or more printed areas differentially printed corresponding to the five or more categories into which the property of the area measured by the sensor device may be allocated, and the sensor device includes means for adjusting the measurement of the property in question following carrying out a sequence of measurements on the set of printed areas.

18. A combination according to any one of Claims 15 to 17 wherein the sensor device is in the form of an elongate casing incorporating a sensor head located at one end thereof and a display screen at or near the other end, the screen located so as to be viewed in a detection substantially transverse to the direction of elongation of the casing.

19. A combination according to Claim 18 wherein associated with the sensor head is a pressure switch adapted to trigger sensing of the property of the printed material when the end of the casing is applied to the surface of the substrate.

20. A combination according to any one of Claims 15 to 19 wherein the sensor device is adapted to sense two or more different properties of the printed material and by measurements of those properties to allocate the area into one of a plurality of categories based on a combination of the two or more measurements.

21. A combination according to any one of Claims 15 to 20 wherein the human appreciable output takes the form of intelligible information displayed on a screen forming part of the sensor device.

22. A combination according to Claim 21 wherein the information is displayed following each measurement of the property effected by the sensor device.

23. A combination according to Claim 21 wherein the information is displayed only after measurement of the property of a sequence of areas successively brought into proximity with a part of the sensor device by the user thereof, the information displayed being derived from the results of the sequence of measurements.

24. A combination according to Claim 23 wherein the information is displayed depends additionally on the overall time taken to complete the sequence.

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25. A combination according to any one of Claims 15 to 24 and wherein the sensor device contains memory means enabling a sequence of measurements to be stored and logic means enabling a sense-perceptible output to be generated in consequence of a logical analysis of the sequence of measurements.

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26. A combination according to any one of Claims 1 to 25 wherein the sensor device is capable of discriminating between at least 5 levels of a property of the printed material.

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27. A combination according to Claim 26 wherein the sensor device can discriminate between at least ten levels of a property of the printed material or at least 20 combinations of two properties of the printed material.

25 28. A combination according to Claim 26 or 27 wherein the sensor device is adapted to effect calibration or re-calibration to assist in discrimination between the levels or combinations of properties.

29. A combination according to any one of Claims 1 to 28 wherein the sensor device includes a sensor module which can be programmed or reprogrammed with data stored in a chip or other device forming part of or

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attached to the printed material.

30. A combination according to Claim 29 wherein the sensor module includes means for decoding a coded stream of infrared radiation
- 5 corresponding to the stored data.

31. Interactive printed material and sensor apparatus comprising one or more sheets of printed material having a plurality of patches of printed ink thereon, and a sensor device including a sensor module capsule of
- 10 discriminating property of the patches of printed ink, and output means capable of producing an audible or visible output in dependence on the interaction between the patch and the sensor module characterised by one or more of the following improved features:

- 15 – configuring the sensor module such as to be able to distinguish between at least five and preferably at least ten different levels of infrared absorption;
- 20 – configuring the sensor module and the printed material with interactive means enabling self-calibration of the sensor module prior to its being used in conjunction with the printed material or during such use;
- 25 – providing means for sensing two or more properties of the patch of printed ink and discriminating the response of each such sensing into discrete signals and combining the responses thereby generated to discriminate a plurality of different conditions; for example if the first property is infra-red absorption, the second property may be optical, e.g. colour,
- 30 fluorescence, or non-optical, e.g. conductivity;

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— providing memory means inside the sensor module capable of maintaining at least transiently a record of successive conditions sensed by the sensor module, and altering the future behaviour of the sensor module accordingly;
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— providing a press switch in the sensor device and means within the sensor module to store and analyse data produced on sequential switch operations and, in response thereto to produce a pre-selected output - visible or audible - and/or to modify the operational mode of the sensor module;
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— providing the sensor device with an output display in the form of a screen and icons, and wherein the screen and icons include at least one icon recognisably reflective of emotion, and providing within the sensor module software for analysing a series of successive inputs, and adjusting the perceived emotion represented by the screen icon accordingly;
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— providing the sensor device with an audio output transducer and programming or configuring the sensor module to drive the transducer to produce an audio output selected from a range of possibilities depending upon the properties of an area of printed material against which the sensor device is placed.

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The range may include recognisable words or phrases or recognisable sounds such as of cheering, sobbing or laughter;
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— providing in the sensor device means capable of projecting on to an area of the printed material adjacent the area against which a sensor head is pressed a patch of colour, for example green for a right answer and red for a wrong one;

- 5 — providing in the sensor device means capable of illuminating
the area on the printed material adjacent an area against which
a sensor head is pressed, the printed material being such as to
reveal visibly to the human eye, under such illumination, one or
more printed features not, or not substantially, visible under
normal illumination;

- 10 — configuring the sensor device in the form of an elongate body
having a sensor tip at one end and a screen adjacent or
substantially adjacent the other end, the screen being located
extending along the side of the elongate body and the sensor
module being programmed to display alphanumeric information
in accordance with the input received by the sensor, where the
15 direction of the line or lines of alphanumeric information read
from left to right runs transversely to the longitudinal axis of the
sensor device;

- 20 — configuring the sensor device as an elongate humanoid or
animal figure with a sensor at one end e.g. an infrared light-
emitter/detector component, wherein the sensor is covered
when the sensor device is not in use by a cover configured to
represent footwear of the humanoid or animal figure;

- 25 — constructing the sensor device as an elongate unit with a
sensor located on one end, the end having a removable cap to
preserve the sensor from dust, etc., the side of the sensor
device having a recess shaped and sized to enable the
removable end cap to be press fitted therein, and wherein the
removable end cap is captive and may be positioned as
30 desired, press fitted into the recess or covering the sensor;

- providing within the sensor module a pre-programmable microprocessor or configurable ASIC or equivalent component and means connected thereto enabling data to be sent from and received by the microprocessor or ASIC via a coded infrared link, and wherein the printed material has associated with it a data storage device which can be interrogated using a coded infrared signal to provide as an output a coded infrared signal which can be decoded by the sensor module and used to programme or re-programme the microprocessor or configure or reconfigure the ASIC therein.

32. Teaching or amusement apparatus comprising printed material and a sensor pen or wand designed to be grasped by the user and brought into contact with the printed material to enable the pen or wand to sense a parameter or property of the portion of the printed material in which it comes into contact, wherein the actual sensing process is triggered by switch means which are actuated by contact between the printed material and the pen or wand, and wherein the pen or wand contains output means such as a visual display or audible output, the display or audible output being driven in accordance with rules pre-programmed into a sensor module, and characterised in that the programmed nature of the response to be displayed on a visual display or reflected in an audio output alters in response to a combination of the switching of the switch means, the value of the parameter or property sensed by the sensor when actuated following actuation of the switch means, and the timing of the switching of the switch means and the change from one sensed value of the parameter or property to another.